DOCUMENT RESUME

ED 259 274 CG 018 375

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TITLE Lateral Orientation Determines Strength of Personality Influences on Self-Attributions.
SPONS AGENCY Western State Coll. of Colorado, Gunnison.
PUB DATE Aug 84
NOTE 29p.; Results of Experiment 1 of this study were presented at the Annual Convention of the American Psychological Association (92nd, Toronto, Ontario, Canada, August 23-27, 1984).
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PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Attitudes; Attribution Theory; *Auditory Stimuli; *Behavior Patterns; *Cerebral Dominance; College Students; Higher Education; *Lateral Dominance; *Personality Traits
IDENTIFIERS *Self Consciousness

ABSTRACT

Two enduring questions in psychology concern the effects on behavior of traits and of attitudes. One method of altering the relative influence of traits or attitudes is by manipulating the activity of those areas of the brain which attend more to the self or to the external environment. Two experiments were conducted to test whether manipulation of lateral orientation can alter patterns of brain activity and thereby produce greater or lesser contributions to behavior of previously measured traits and attitudes. In Experiment 1, 37 right-handed undergraduates completed the Private Self-Consciousness Scale several weeks prior to listening to taped messages and assigning attributions to outcomes described in the messages. Results indicated that subjects who listened only with their right ear produced self-attributions consistent with their trait of self-consciousness, while those who listened only with their left ear did not respond consistently with their self-consciousness trait. In Experiment 2, 28 right-handed undergraduates completed a measure assessing attitudinal orientation toward affirmative action. Subjects later listened with their right ear only, left ear only, or with both ears, to a taped, hypothetical court case involving affirmative action, and then responded as a juror. The results indicated that behavior varied directly with attitude for subjects who listened with their right ear only, but not for those who listened with their left ear only or with both ears. It is argued that consistency is a better explanation for these effects than is availability. (NRB)

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ED259274

Lateral Orientation Determines Strength of Personality Influences on Self-Attributions

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This research was partially supported by an Undergraduate Research Grant awarded to the second author by the Western State College Foundation.

We gratefully acknowledge the assistance of Phillip Broscovak in the preparation of the audio tape for both experiments, of Owen Blacklock, George Cassidy, Don Maguire, and Dale Nielsen in the rating of the essays for Experiment 2.

Results of Experiment 1 were presented at the 92nd annual convention of the American Psychological Association at Toronto, August 1984.

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Abstract

Two experiments were performed to test whether the strength of the influence of traits and attitudes on social behaviors could be affected by induced lateral orientation. In Experiment 1 (N=37), subjects who were allowed to listen only with their right ear replicated the findings of Buss and Scheier (1976) that high private self-consciousness was a predictor of high self-attributions. As predicted, those who listened to the same message only with their left ear did not respond in a manner consistent with their self-consciousness trait. Experiment 2 (N=28) demonstrated that the effect of unilateral hemispheric activation on the attitude-behavior relationship is such that when the left hemisphere is relatively more activated the relationship is obtained, while it disappears during relative right hemisphere activation in right handers. It was argued that consistency is a better explanation for these effects than is availability.

Two enduring questions in psychology concern the effects on behavior of traits (Funder, 1983; Mischel, 1968; Mischel & Peak, 1982), and of attitudes (Ajzen & Fishbein, 1970, 1977; Bagozzi, 1981; Dillehay, 1973; Wicker, 1969). These have been shown by Sherman and Fazio (1983) to be closely related issues.

One method of altering the relative influence of traits or attitudes has been to manipulate the relative salience of environmental cues (McArthur & Post, 1977). Another method has been to observe the influences on behavior of the pre-existing structures of attitudes (Markus,1977; Wood, 1982; Wyer & Hartwick, 1980). A third approach has been to manipulate the attention of the individual toward either internal or external cues (e.g., Davies, 1982; Froming, Walker, & Lopyan, 1982; Johnson & Downing, 1979; Prentice-Dunn & Rogers, 1980; Scheier, Carver, & Gibbons, 1979).

A variation of this third approach is the manipulation of the activity of those areas of the brain which attend more to the self or to the external environment. Perhaps the most powerful method of influencing regional brain activation is that of

induced lateral orientation (ILO). This manipulation is based on the argument by Kinsbourne (1970; 1975; Kinsbourne & Hicks, 1978) that when an individual attends laterally, the opposite hemisphere of the brain is activated. This activation tends to prepare that hemisphere for other functions which are processed there and thus facilitates their performance. This effect may be the result of an increase in cerebral blood flow which was observed in the contralateral cerebral hemisphere by Malamed and Larsen (1977) in their subjects who attended lateral stimuli.

ILO has been demonstrated to enhance visual performance (Bowers, Heilman, & Van Den Abell, 1981) and aural performance (Morais, 1978) in the ipsilateral field and to improve spatial performance with ILO to the left (Casey, 1981; Hines & Martindale, 1974; LaTorre & LaTorre, 1981; Walker, Wade, & Waldman, 1982). It has also produced the expected increases in verbal performance with ILO to the right (Gopher, 1971 cited in Kahneman, 1973; Gross, Franko, & Lewin, 1978; Lempert & Kinsbourne, 1982; Walker et al. 1982) and in persuasion with ILO to the left (Drake & Bingham, in press).

Attention to the self versus attention to the environment may be one of the fundamental functional

asymmetries of the human brain. The nature of this asymmetry appears to be that in the majority of right-handers the right cerebral hemisphere attends more than the left to the external world (Dimond, 1976, 1979; Kimura, 1973). At the same time, attention to the self shows a left hemisphere advantage by improving right-visual-field processing (Charman, 1979) and producing an increase in relative left hemisphere EEG activation (Cacioppo & Petty, 1980).

The purpose of the present research was to test whether it is possible through the manipulation of right or left orientation of attention to alter patterns of brain activity in such a way as to produce respectively greater or lesser contributions of previously measured traits and attitudes to behavior.

Experiment 1

This experiment replicated the methods of Buss and Scheier (1976) in looking at trait effects on self attributions, with the addition of the manipulation that all subjects were making their attributions while attending either to the right or to the left. They had found that those who scored high on the trait measured by the private self-consciousness scale (Fenigstein, Scheier, & Buss, 1975) attributed more responsibility to themselves in hypothetical situations than did those

people who scored low on the scale. This was true whether the outcomes were described as being positive or negative.

Method

Subjects. Introductory psychology students volunteered from their classes in return for points toward their course grade. Of the 43 who volunteered, only those who described themselves as right handed, 17 females and 20 males, were included in the analysis.

Procedure. About one month before the experiment the subjects filled out in class the private self-consciousness scale (Fenigstein et al., 1975). They were unaware that the questionnaire had anything to do with the experiment. Following the method of Buss and Scheier (1976) those who scored in the upper third of the distribution were designated high, those in the bottom third low.

Subjects came to the experimental session individually and were seated in a chair facing a desk. They sat faced forward toward the desk throughout the procedure. They were assigned randomly within blocks to listen through headphones to a tape recorded message which was played only to the right or to the left ear. This manipulation was designed to orient the subject's attention toward the direction from which they heard

the message. The tape consisted of instructions followed by descriptions of three positive outcome and three negative outcome hypothetical situations devised by Duval and Wicklund (1973). The tape lasted approximately five minutes. After each situation was described, a pause allowed the subjects to indicate on a response sheet the percentage of responsibility they attributed to the self and to the other person for the outcome described in the situation.

The mean percentage of responsibility attributed to oneself over the six situations was calculated for each subject. Support for the hypothesis would be indicated by a pattern of mean self attributions which varied directly with the predictor trait for subjects oriented to the right but which varied independent of the trait for those oriented to the left. The statistical significance of the effect would be tested by the manipulation by trait interaction. Another statistic which would provide similar support for the hypothesis would be a greater Pearson correlation coefficient between self attributions and private self-consciousness scores during right than during left manipulated orientation.

Results and Discussion

An unweighted means analysis of variance was

performed on the mean percentage responsibility attributed to oneself. The treatment variable was the ear to which the taped message had been played and the blocking variables were subject gender and high-versus-low private self-consciousness. There were no significant differences between the means for the left ear, $\underline{M}(14)=56.72$, and the right ear, $\underline{M}(12)=56.73$, $\underline{F}<1$. There were no other main effects. In the test of the hypothesis, the interaction between the ear-of-entry manipulation and high-versus-low private self-consciousness was found to be significant, $\underline{F}(1,22)=6.22$, $\underline{p}<.025$.

Insert Table 1 about here

Inspection of Table 1 reveals that as predicted only subjects listening with the right ear replicated Buss and Scheier (1976) by producing self attributions consistent with their trait of self-consciousness. For those subjects listening with the left ear it had been predicted that the resultant selective activation of their right (opposite) hemisphere would tend to focus their attention toward the external world rather than toward themselves. The results supported this hypothesis. Tests of simple main effects found that

the two means for the right ear were the only pair significantly different from each other, $F(1,11)=4.86$, $p<.05$.

A further test of this result was made by calculating Pearson correlation coefficients between the private self-consciousness score and the self-attribution behavior for all subjects in the experiment, separated according to ear of entry of the message. For those to whom the message was heard in the right ear, $r(16)=+.511$, $p<.05$, showing a high consistency of behavior with the measured trait. For those hearing the message only in the left ear a near-zero correlation was found, $r(17)=-.010$, $p>.50$. However, the difference between these two coefficients was only marginally significant, $Z=1.60$, $p<.06$, in a one-tailed test.

Experiment 2

A second experiment was performed to attempt to extend this effect to the attitude-behavior relationship. In addition, a control group which heard the messages in both ears was added to see how the effects of the manipulations compared with normal listening situations. This experiment was designed to follow closely the methods of Experiment 1 of Snyder and Kendzierski (1982). The hypothesis was that

behavior would vary directly with attitude for right-handed subjects whose left hemisphere was activated by rightward attentional orientation, but not for those whose right hemisphere was activated by leftward attentional orientation.

Method

Subjects. Students volunteered from general psychology classes as a means of gaining points toward their course grade. Of the 33 subjects who completed the experiment, only those 16 females and 12 males who described themselves as using only their right hand on four or more of a list of six activities were included in the analysis.

Procedure. About four to eight weeks before the experimental sessions, subjects filled out a personality inventory in class. Among the items were four which assessed general attitudinal orientation toward affirmative action, taken verbatim from Snyder & Kendzierski (1982).

Subjects came individually to the experimental session and were seated in a chair facing a desk. They remained facing forward all during the session. Subjects were randomly selected to listen to a taped message played over headphones to their right ear only, to their left ear only, or to both ears. They heard

instructions, a description of the details of a hypothetical court case, and the charge from the judge to the jurors labeled Attitude relevant situation (Snyder & Kendzierski, 1982). The court case involved a suit by a Ms. Harrison against an employer, who allegedly refused to give her a job because of her gender. Subjects then indicated what action they would take as a juror, wrote an explanation of why they thought as they did, and answered on a 10-point scale four questions indicating their specific reasons for making the decision that they did.

The essays were scored by four independent judges on a scale of 1 to 10 in response to the statement "The author is in favor of hiring Ms. Harrison, the female plaintiff," with a 10 indicating strong agreement. An interrater reliability of .91 was achieved among the four judges. Following Snyder and Kendzierski (1982), the mean rating of the essay was summed with the scaled responses of the four questions to produce the dependent variable, the Behavioral Decision Index. This measure could range from a score of 5 to a score of 50.

As in Experiment 1, support for the hypothesis would be provided by a significant manipulation by original attitude interaction, but only if the pattern

of means indicated that the dependent variable followed the original attitude during left hemisphere activation but not during right. Further support would be provided by a greater Pearson correlation between attitude and behavior during relative left hemisphere activation.

Results and Discussion

Following the method of experiment 1, subjects were divided into upper and lower thirds on the basis of their general attitudes toward the concept of affirmative action as indicated on the pretest. An analysis of variance, with manipulated orientation as the treatment variable and initial attitude and gender as blocking variables found a significant interaction between the treatment and the general attitude on the pretest, $F(2,9)=5.69$, $p<.03$. The pattern of means in Table 2 is as predicted, so the hypothesis is supported significantly by the data.

Insert Table 2 about here

Because the main effect for gender was not significant ($F<1$), the analysis was collapsed across this variable, producing an even stronger measure of the interaction of interest, $F(2,14)=8.60$, $p<.005$. The

main effects of the treatment and of the pretest attitude were also significant, $F(2,14)=7.83$, $p<.01$ and $F(1,14)=12.99$, $p<.005$ respectively. However, due to the significant interaction, tests of simple main effects are called for here. Tests across the rows of Table 2 produced respectively $F(1,4)=1984.44$, $p<.001$, $F<1$, and $F<1$. This was the pattern predicted. Tests across the columns produced respectively $F<1$ and $F(2,6)=11.27$, $p<.01$. This effect had not been predicted, but may be due to a floor effect in the left column. A Tukey HSD multiple comparison test was performed on the three means of the high column. A critical value of 13.10 was calculated, which indicates that the activated left hemisphere mean is significantly different from the other two ($p<.05$) but they are not significantly different from each other.

The hypothesis was further supported by the correlations between pretest general attitude and the dependent variable, which are shown in column 2 of Table 3. The ranking of the correlations are as predicted, and the coefficients for left versus right ILO are significantly different from each other, $Z=1.73$, $p<.05$, one tailed.

Insert Table 3 about here

General Discussion

In both experiments the hypotheses were supported. During manipulation of selective left hemisphere activation, the findings of Buss and Scheier (1976) were replicated in Experiment 1 and the findirgs of Snyder and Kendzierski (1982) were replicated in Experiment 2. In the former the measured trait predicted variations in behavior and in the latter the measured attitude correctly predicted the behavior. However, when relative activation was manipulated to the right cerebral hemisphere, these effects were not only attenuated, but also tended toward a reversal in each case.

It was suggested by Mischel (1968, p. 294) that the effects of personality or dispositions are reduced when stimulus conditions are potent. In the present experiments, instead of manipulating the potency of the external stimuli, the reactivity of the subjects toward internal or external influences on behavior was manipulated by means of induced lateral orientation.

These findings had been predicted from earlier research which had demonstrated that lateral orientation activates the functions of the opposite cerebral hemisphere and that left hemisphere activation is associated with attending to oneself while right

hemisphere activation is related to external-directed attention. The present research supports those previous findings.

Tversky and Kahneman (1973, 1974) might describe these effects in terms of availability. If left hemisphere relative activation is associated with attention to the self, as it was demonstrated to be by Cacioppo and Petty (1980), then it should also be associated with attention to those aspects of the self called traits and attitudes.

Among the mechanisms suggested by Tversky and Kahneman as contributors to availability were retrievability and search set. They suggested that retrievability was a function of storage techniques, which is not an issue in these experiments, which used naturally-occurring, already-existing traits and attitudes. It could, however, be a contributing factor to the results of the present experiments if, in some way, there is an asymmetrical representation of trait and attitude storage in the brain. Search set depended on the recall processes which were used. It is conceivable that there is a functional asymmetry in the brain in either the kinds of search processes used or else in the accessibility of information between the cerebral hemispheres.

One way in which this could operate is that when leftward orientation activated the right hemisphere there was a mild language deficit produced similar to that observed in the experiments of Gross et al. (1978), Lempert and Kinsbourne (1982), and Walker et al. (1982). Such a language deficit, no matter how small, might account for the fact that during leftward orientation subjects' behavior was unrelated to their measured personality trait or attitude. If they were unable to understand the message on the response sheet, or else were unable to access language-coded self-related information, they might show a pattern of behavior which appears random with relation to their previously measured traits and attitudes.

An argument against this language-deficit explanation comes from a study by Drake and Bingham (in press). They found that playing a counterattitudinal message only into the left ear produced significantly more persuasion than did playing the same message only to the right ear. The language-deficit model would predict that messages to the right ear (left-hemisphere) would be more easily comprehended and so more capable of persuading the listener. As the findings of the Drake and Bingham experiment were the opposite of the prediction from the language-deficit

model, it appears to be weakened.

An alternative explanation of the findings of the two experiments reported herein is consistency. Gazzaniga has said that "the left language system is intimately linked to a cognitive system that strives for consistency and order in the buzzing chaos of behaviors" (1983, p. 536). In the case of exposure and liking, which we normally expect to find correlated with each other (Zajonc, 1968), it was found by Seamon, Brody, and Kauff (1983) that this was true only for stimuli exposed to the left hemisphere. For those stimuli exposed only to the right hemisphere the expected relation between exposure and liking was not obtained. In an attempt to conceptually replicate this finding, Drake (1984) demonstrated the same effect for rated familiarity and rated liking of famous persons. When the left hemisphere was relatively activated there was a significant correlation between the ratings, but during relative right hemisphere activation the correlation was significantly reduced. Thus the consistency explanation for the obtained results can be seen to have some independent empirical support.

The application of the availability hypothesis to these results implies acceptance of the assumption that either the processes of retrieval or else the trait and

attitude information are represented asymmetrically between the two hemispheres, and that they are relatively inaccessible to the behaving organism during patterns of relative right hemisphere activation. These assumptions are plausible, but relatively difficult to accept for the intact brain. The principal difficulty with their acceptance is that such acceptance would demand that one imagine an organism motivated to act in accord with its traits and attitudes, but unable to access either the necessary processes or information under a certain pattern of relative cerebral activation. It seems much easier to accept an assumption of asymmetry of consistency motivation, such that one pattern of brain activation manifests this motivation to a greater extent than do other patterns of relative regional activation. Thus the information may be available under varying activation patterns, but is not necessarily acted upon in some cases.

Of course the present experiments have not solved this controversy, but rather have created it. A possible way of approaching the solution would be through dissonance methods of creating inconsistency and then testing under what patterns of activation attempts are made to reduce that inconsistency.

This paper does not describe a brain localization model of behaviors. One should not conclude that right-handers' traits or dispositions exist solely in the left hemisphere nor that the cerebral hemispheres act independently. The intact human brain functions in an integrated manner, and the present experiments, along with those cited studies which led to its design, concern themselves only with the alterations in behavior resulting from manipulation of patterns of regional activation in the normal brain.

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Table 1

Mean Percentage of Attributions to Self as a Function of Trait Self-Consciousness and Source of Message

	Private self-consciousness	
	Low	High
Activated left hemisphere *	48.7	61.8
n	(5)	(8)
Activated right hemisphere	58.7	54.4
n	(7)	(6)

* The means in this row are the only pair significantly different from each other, $p<.05$.

Table 2

Mean Behavioral Decision Index Score as a Function of Initial Attitude toward Affirmative Action and Relative Hemisphere Activation

	Pretest Attitude Toward Affirmative Action	
	Low	High **
Activated left hemisphere *	20.7	41.7a
n	(3)	(3)
Control	23.5	27.7b
n	(6)	(3)
Activated right hemisphere	21.5	19.7b
n	(2)	(3)

* The means in this row are the only horizontal pair significantly different from each other, $p<.001$.

** Means in this column with different subscripts are significantly different from each other, $p<.05$.

Table 3

Pearson Correlation Coefficients between Trait and Behavior for Experiment 1 and between Attitude and Behavior for Experiment 2, as a Function of Relative Hemisphere Activation

	Experiment 1 *	Experiment 2 **
Activated left hemisphere	r=+.511	r=+.771
n	(18)	(10)
Control	No control	r=+.423
n	group	(12)
Activated right hemisphere	r=-.010	r=-.168
n	(19)	(6)

* Correlation coefficients for right and left in this column are marginally different from each other, $p<.06$.

** Correlation coefficients for right and left in this column are significantly different from each other, $p<.05$.